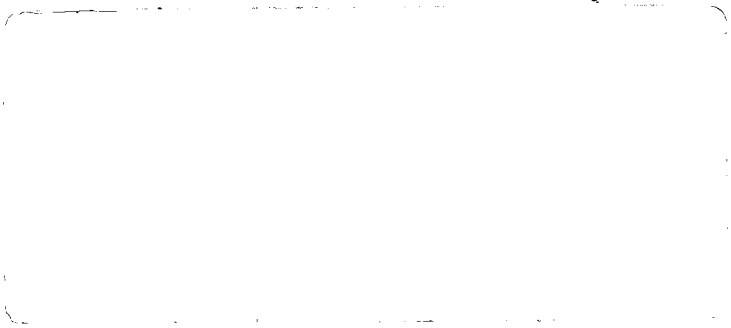
Passaic Coastal Zone Management Program



COASTAL ZONE

INFORMATION CENTER

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RAHWAY RIVERFRONT STUDY
PHASE I
RAHWAY, NEW JERSEY

"This acknowledges the financial assistance provided by the Coastal Zone Management Act of 1972, as amended, with funds administered by the National Oceanic and Atmospheric Administration, Office of Coastal Zone Management. This study was prepared under the supervision of the New Jersey Coastal Energy Impact Program of the New Jersey Department of Energy. However, any opinions, findings, conclusions or recommendations expressed herein are those of the author and do not necessarily reflect the views of NOAA or NJ DOE."

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Woodbridge, New Jersey

June 1982

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INTRODUCTION

Waterway's are a predominant factor in the City of Rahway's landscape. The City is traversed by the Rahway River and its three major tributaries, the North Branch, the South Branch, and Robinson's Branch. The main branch of the Rahway River and the lower portion of the South Branch are subject to tidal influences.

Like many of New Jersey's Rivers, the condition of the River and its major tributaries has deteriorated gradually over the years to a point where much of the recreational value of the waterways has been lost. Siltation, pollution and increased flooding have contributed to the River's decline. Both the City and Union County Department of Parks have made efforts to improve the River's condition. The County has developed and maintained parks at the northern ends of both the North Branch and Robinsons Branch. The City has concentrated its efforts on the South Branch and the Rahway River and has been concerned with both flood control and recreational improvements.

To date, however, there is no comprehensive plan for future development of the River and its major tributaries. The City's 1974 Master Plan addresses the issue, but in very general terms and should be considered as a springboard for the development of a detailed plan.

It is the purpose of this study to gather all background data necessary to prepare recommendations for improvements to the Rahway River riverbed and embankments south of Grand Avenue for the purpose of improving the river's recreational value. The actual land use plan and recommendations for improvements will be prepared in a Phase II study to follow.

This report has been prepared by Robert E. Rosa Associates Inc., the City's Planning Consultant and Landscape Architect. All hydraulic and engineering data was subcontracted to Elson T. Killam Associates Inc., an Environmental and Hydraulic Engineering Firm for their expertise. The result is a combined report of all background data necessary to enter Phase II of the project.

EXISTING LAND USE AND ENVIRONMENTAL CONDITIONS

RAHWAY RIVERFRONT STUDY

The Rahway River, located in Union County, is a tributary of the Arthur Kill and has a drainage area of 40.9 square miles. The River has both fresh water and tidal sections. This study concerns the tidal portion of the Rahway River from West Grand Avenue in Rahway to the Rahway/Linden Border. The study area extends on both sides of the river generally within one block of the river.

Two maps that describe physical characteristics of the area have been included in this report. Map #1 illustrates existing land uses, public or private ownership, the circulation system, and zone bounderies. Map #2 illustrates topography, soil types, vegetation, water quality and the wetlands boundary line.

Existing Land Use

Land use and ownership are shown on Map #1. Land use categories shown are single family residential, multi-family residential, commercial, industrial, recreation and open space, semi-public, public facilities and vacant land. In addition, public or private land ownership is indicated. The following chart shows the breakdown of land uses within the waterfront area.

LAND USE	PRIVATE OWNERSHIP		PUBLIC OWNERSHIP		TOTAL	
	Acres	% of total	Acres	% of total	Acres	%
Residential						
Single-family	20.03	13.24	0	0	20.03	13.24
Multi-family	11.14	7.37	5.40	3.57	16.54	10.94
Commercial	22.38	14.80	0	0	22.38	14.80
Industrial	20.11	13.30	0	0	20.11	13.30
Recreational	0	0	3.89	2.57	3.89	2.57
Semi-Public	5.60	3.70	0	0	5.60	3.70
Public Facilities	0	0	5.06	3.35	5.06	3.35
Vacant	24.44	16.15	33.19	21.95	57.63	38.10
Total	103.70	68.56	47.54	31.44	151.24	100%

Residential

Residential land use categories occupy 36.57 acres or 24.18% of the total land within the study area. For the most part, residential land does not front directly on the river, but is separated from the river by other land uses, dike easements or streets.

Although single family dwellings are the predominant use, multi-family dwellings occupy a larger than normal land area. While approximately 2% of the City's total land area is devoted to multi-family use, approximately 11% of the study area is devoted to multi-family use. This is due mainly to the fact that the study area is located adjacent to the City's downtown business district, and multi-family uses are better located near the convenience of downtown shopping, transportation and facilities.

Most residential lands are privately owned; however, two publicly owned Senior Citizen Housing Complexes exist on Milton Avenue and W. Grand Avenue.

Commercial

A total of 22.38 acres or 14.80% of the study area is occupied by commercial land use. Most of this is located in the upper section of the study area in the downtown shopping district, and along U.S. Route 1. All commercial land uses are under private ownership.

Industrial

Industrial land uses occupy 20.11 acres or 13.30% of the study area. They are concentrated in three separate sections of the area. Most are located east of U.S. Route 1 on the south side of the river in an Industrial Zone. The second area of concentration is on either side of Lawrence Street north of the river. The third area of concentration is between Elizabeth Avenue and the railroad in the northern section of the study area. All industrial uses are privately owned.

Recreational

Recreational land uses occupy 3.89 acres or 2.57% of the study area. These are limited to two publicly owned parcels, both of which are passive open space. One parcel which is bound by Elizabeth Avenue, W. Grand Avenue, and the river, is owned by Union County. It is part of the County Park System that extends northward on the North Branch of the Rahway River. The second parcel is located at the confluence of the Rahway River and the South Branch, on East Hazelwood Avenue and is owned by the City.

Semi-Public

Semi-Public land uses occupy 5.60 acres or 3.70% of the study area. They consist of a variety of uses including the Rahway Valley Sewage Authority plant on Parker Street and E. Hazelwood Avenue, the JFK Community Center on E. Hazelwood Avenue, and the Rahway Yacht Club on Paterson Street.

Public Facilities

Public Facilities occupy 5.06 acres or 3.35% of the land within the study area. Three public facilities exist within the study area. They are City Hall at the corner of Main Street and W. Milton Avenue, the public works garage on Hart Street, and a public parking lot on Lewis Street and Dock Street.

Vacant

Vacant land occupies the largest area of any land use within the study area. A total of 57.63 acres or 38.10% of the land is vacant. This compares with a City-wide total of approximately 6%. This can be explained by the fact that the last land to be developed is usually that which has environmental constraints. In Rahway, most of the land that has not been developed is located along the river and its tributaries, within flood plains.

Vacant land is the only land use that has both private and public ownership. Approximately two-fifths of the vacant land is privately owned. Of the remainder which is publicly owned, portions of it have been dedicated for parkland while other portions are currently up for sale.

Summary

Land uses within the riverfront study area are varied. Vacant land is the dominant land use; however, significant acreages of residential, commercial and industrial land uses also exist. Recreational land use occupies the least amount of land area within the study area. Approximately 72% of the land is privately owned and 28% publicly owned.

Circulation System

The Circulation System in the riverfront area consists of streets and sidewalks. There are no designated bike paths within the area.

U.S. Route 1, a major four lane expressway, crosses the river midway between Lawrence Street and the confluence with the South Branch of the Rahway River. Current plans for the widening and realignment of Route 1 call for the highway to be divided at a point just south of the Rahway River and a new elevated bridge to be constructed across the river at Lawrence Street. Once across the river the new alignment of Route 1 will continue in a northeast direction approximately parallel to the river and rejoin the existing alignment of Route 1 at Patterson Street. The new alignment will be located within 200 to 300 feet of the river. The existing alignment is located approximately 1000 ft. from the river. The new alignment will also result in a 600' section of the river being located between the new elevated bridge and the existing elevated bridge. This will have a substantial visual impact on that portion of the river but will not have a substantial functional impact on the waterfront in that area.

Five other streets cross the river. Two of these streets are major streets. Elizabeth Avenue has a right-of-way width of 80 ft. and a pavement width of 48 ft. Lawrence Street has a right-of-way width of 66 ft., a pavement width of 45 ft., and is a county road. Milton Avenue is a collector street and has a right-of-way width that varies from 58-66 ft. and a pavement width that varies from 40-46 ft. It is also a County road. The two remaining streets that cross the river are minor streets and have recommended right-of-way widths of 50 ft. They are Monroe Street and Bridge Street.

All of the streets within the study area are two-way with the exception of two. Main Street north of W. Milton Avenue is one-way north and Essex Street between E. Milton Avenue and Washington Avenue is also one-way north.

Pedestrian paths within the waterfront area are limited to sidewalks along public streets. Although not all streets within the project area have sidewalks, there are sidewalks on all streets in residential areas and areas that would be expected to generate significant pedestrian traffic. The existing sidewalks provide adequate access to the river and adjoining property.

Zoning

Zones within the waterfront area include: R-2 Single Family Residential; R-3 Garden Apartment Residential; R-4 Hi-Rise Residential; B-1 Neighborhood Business; B-2 Central Business; B-3 Highway Business; B-4 Regional Business; I-1 Light Industrial; and O-1 Open Space.

The R-2 Single Family Residential Zone located along portions of Essex Street, E. Hazelwood Avenue and E. Milton Avenue, permits single family residences and professional home offices on minimum 5000 sq.ft. lots. Municipal parks and playgrounds are also permitted. In addition, public utility installations and other public uses are permitted as conditional uses.

The R-3 Garden Apartment Zone occupies a significant part of the area boarded by Main Street, Milton Avenue, Essex Street and E. Hazelwood Avenue. A second small area is located on W. Grand Avenue. It permits Garden Apartment dwellings at a maximum density of 20 units per acre, parks, and playgrounds. A minimum lot size of two acres is required. Public utility installations, houses of worship, and other public uses are permitted as conditional use.

The R-4 Hi-Rise Residential Zone abuts the river at E. Hazelwood Avenue and Main Street. It permits multi-family hi-rise dwellings at a maximum density of 50 units per acre. It also permits a variety of public and private, non-profit facilities. The minimum lot size is 5 acres. Public utility installations, houses of worship, non-public hospitals and other public uses are permitted as conditional uses.

The B-1 Neighborhood Commercial Zone occupies only two lots within the area on W. Grand Avenue. Convenience shopping and service stores such as bakery shops, barber shops, drugstores, hardware stores and luncheonette's are permitted.

The B-2 Central Business Zone adjoins the river along Dock Street and permits a variety of commercial uses that would service a larger segment of the population than neighborhood business. This zone includes a portion of the downtown shopping district in Rahway.

The B-3 Highway Business Zone was established along Route 1 to provide areas for retail sales and services to serve the travelling public. A large variety of commercial uses are permitted in the zone. This zone also encompasses a portion of the downtown shopping district.

The B-4 Regional Business Zone is located between the river and U.S. Route 1 to the south of Route 1. It provides an area for larger retail sales and services that serve a wider region than the B-3 Zone.

The I-1 Light Industrial Zone is located adjacent to the Pennsylvania Railroad and at the eastern end of E. Hazelwood Avenue. It provides for the expansion and development of light industrial land uses. Permitted uses include various light manufacturing and fabrication uses, food and associated industries, administrative and executive office buildings, laboratories, wholesale sales and distribution and other similar industrial uses. The minimum lot size permitted is 40,000 sq.ft.

The O-1 Zone includes all land owned by the City or Union County that is being utilized for park purposes or left in an open state for future park, flood protection, or conservation purposes. It includes two parcels of land, one along Avon Way and one at the corner of W. Grand Avenue and Elizabeth Avenue.

Topography

The Topography of the area is shown on Map #2. The natural topography of the study area is relatively flat with slopes ranging from 1% to 5%. Steeper slopes occur in areas where fill has been deposited, such as along the eastern bank of the river adjacent to Essex Street, and where the U.S. Army Corp. of Engineers has constructed a dike along the west bank of the river between its confluence with the south branch and Monroe Street. These man-made steep slopes along the river banks limit access to the river but do not limit development of lands adjacent to the river at these points. None of these slopes are considered hazardous.

Soils

The U.S. Department of Agriculture is currently mapping and classifying soil types throughout Union County, including the study area. Essentially there are three types of soil within the study area: Urban Land; Tidal Marsh; and Alluvial Land.

Urban Land is land that has been built upon, excavated, or significantly disturbed by development so that the natural characteristics of the parent soil are significantly altered or cannot be determined. There are five separate categories of Urban Land within the study area:

UL-Urban Land - This is the most predominant soil type in the study area. It is usually covered by buildings or asphalt and cannot be associated with any specific parent soil.

UG-Udor Thents Loamy and UH-Udorthents or Sanic Substrattum. Both of these soil types are fill land. Their characteristics have not yet been fully defined by the Department of Agriculture.

BUB-Boonton-Urban Land-Haledon Association - This is an urban land soil that has some characteristics of both Boonton and Haledon soils. Boonton soils are formed in glacial till and are characterized by a silt loam surface layer and increasing sand and gravel as the soil depth increases. They are well drained. Haledon soils, also formed in glacial till, are deep, somewhat poorly drained soils.

HUA-Haledon-Urban Land-Haledon Variant Assoc. - This is an urban land soil that has some characteristics of the Haledon soils as well as some characteristics of the Haledon variant soils which are similar to Haledon soils as described above.

Tidal Marsh Soil is located in relatively flat areas that are subject to tidal influence. The only tidal marsh soil in the study area is SU-Surfihemists which is located at the extreme southeastern end of the study area. This soil is continually saturated and has a high sulfur content.

Alluvial soils are those that are located in flood plains and are subject to frequent flooding. They are formed by siltation that occurs when flood waters subside. Alluvial soils are located at the extreme northern end of the study area.

Vegetation

The various types of vegetation representative of the study area are designated by a symbol on Map #2. A symbol is in a particular location because that species occured in that area more so then anywhere else in the study area. Therefore, a species may occur in a given area but is not the predominant species. Vegetation representative of the study area is as follows: Seaside goldenrod, cattails, staghorn sumac, white willow, common mulberry, green ash, tree of heaven, swamp white oak, american elm and London Planetree.

Water Quality

According to the New Jersey Department of Environmental Protection the water quality of the Rahway River is rated as fair to poor. The tidal portions are classified as TW-2 and TW-3. The TW-2 classification means the water is suitable for secondary contact recreation, which are recreation activities where the probability of significant contact or water ingestion is minimal and includes but is not limited to boating, fishing, and those other activities involving limited contact with surface waters incident to shoreline activities. The TW-2 classification waters are also suitable for the propagation and maintenance of fish populations; the migration of anadromous fish (fish that spend a part of their lives in the sea or lakes, but ascend rivers to spawn); the maintenance of wildlife and other reasonable uses. The TW-3 classification is the same as the TW-2 classification with the exception that the TW-3 waters are not suitable for the propagation of fish. The TW-3 classification begins at the Route 1 crossing and extends downstream.

The chart on Map #2 shows specific water quality data for three separate time periods dating from 1958 to 1974. More recent data is not available. The data shows significant improvement in the overall water quality over the years. Each of the items shown on the chart is explained below:

DO-Dissolved Oxygen - is a measure of the amount of oxygen that is dissolved in the river water. It is measured in mg/liter. The minimum requirement for TW-2 water is 4.0 mg/l. The minimum for TW-3 water is 3.0 mg/l.

BOD-Biochemical Oxygen Demand - is a measure of the amount of oxygen microorganisms in the water utilize. On the chart it is shown as the number of milligrams of oxygen per liter of water that will

be consumed by microorganisms over a 5 day period. There are no standards for BOD, however it should be noted that, as a rule, when BOD increases, DO decreases.

Water Temperature - is subject to a number of natural variables including season, air temperature and depth. It becomes a factor in water quality when discharges of water (for example water used in industrial cooling processes) or other substances significantly raise the natural water temperature. Such unnatural changes in the water temperature can make the water unsuitable for existing species of plants and animals in the river. Generally, increases of more than 2.2°F from normal in the winter and 0.8°F during the summer are unacceptable. In addition, water temperature should not exceed 29.4°C (85°F).

Turbidity - is a measurement of how clear the water is. It is measured in Nephelometric Turbidity Units (NTU) which indicates the amount of light that is transmitted through the water. A measurement of 1 NTU is considered clear water. TW-2 water must average 10 NTU maximum over a 30 day period and cannot exceed 30 NTU at any time. TW-3 water must average a maximum of 15 NTU over a 30 day period and cannot exceed 50 NTU at any time.

PH- indicates the acidity or alkalinity of the water. To be acceptable, the ph should be between 5.5 and 8.5 with 5.5 being more acid and 8.5 being more alkaline.

Fecal Coliform - is a measurement of bacterial activity in the water and can be an indication of disease potential of the water. Measured in units per 100 ml of water, the count shall not exceed 770 for TW-2 water and 1500 for TW-3 water.

Ammonia - (NJ3-N) is measured in mg/liter and should not exceed 0.5mg/l. In 1973-1974 the levels of ammonia in the river were generally below the standard.

Phosphorous (T P04) is measured in mg/liter and should not exceed .03 mg/l. As of 1974 phosphorous levels in the river exceed the standard and had increased over the previous four year period.

The availabe data, although limited, shows that water quality of the Rahway River is improving. In 1973-1974 all of the above categories were well within TW-2 limits with the exception of phosphorous.

Waterfront Boundary

The boundary of the waterfront is shown on Map #3. The boundary was determined using the landward boundary of the State's jurisdiction under the Waterfront Development Act. The area is defined as "all tidal waterways and lands adjacent thereto up to the first property line, public road or railroad right-of-way generally parallel to the waterway, provided that the boundary is between 100 and 500 feet from the waterway."

Views

There are numerous points along the Riverfront that provide excellent views of the River. Most of these occur along streets that run adjacent to or over the River. Map #3 shows 15 of the best views of the River. Photographs of these views are shown on the picture board that accompanies this report.

Public Access

Significant points of public access to the Riverfront are shown on Map #3. These are:

A. The southernmost tip of the Union County Park that extends upstream along the North Branch of the Rahway River. It is currently utilized as open space with no active recreation associated with it.

B. The dike along the western bank of the River which extends from Monroe Street downstream to the junction with the South Branch. The top of the dike is flat and approximately 10 feet wide, offering an opportunity to stroll along the Riverfront.

C. A passive park approximately 1/2 acre in size located on the southern side of the River's junction with the South Branch. Although this site offers excellent access to the river, it is located adjacent to heavily travelled E. Hazelwood Avenue and is not suitable for intensive development because of the traffic hazard.

D. A vacant City owned tract of land at the end of Essex Street has over the years been used as a landfill site. Its location away from residences and its size, which would allow for some parking, make it potentially the best site along the Riverfront (in the study area) for development as an active recreation area.

E. The Rahway Yacht Club on Paterson Street has the only boating facility within the study area. The facility is subject to the limitations provided by the depth of the river which is too shallow at low tide in this area for most boats to navigate.

F. The City Dock on Barnett Street at one time served as a boating facility. The dock currently is dilapidated and has been out of use for some time. Due to the small size of the site and the residential nature of Barnett Street, the site is not suitable for future development as a major point of access to the River.

G. The area shown on the Map as Avon Way is a vacant parcel of City owned land that has been designated as open space. It currently offers very limited access to the river but could be developed to offer access for various recreational activities.

Summary

The Rahway Riverfront area is a diverse area totalling approximately 151 acres not including the river. Land use within the area is varied and includes residential, commercial, industrial and recreational uses, as well as approximately 58 acres of vacant land. Zoning is as mixed as land use.

The circulation system is limited to streets and sidewalks. No designated bikeways exist.

Physical features-topography, soils and vegetation are fairly uniform throughout the area. The topography is generally flat with steeper slopes on the river bank. Soils are predominantly urban soils that have been disturbed to the point that they have no identifiable natural characteristics. Vegetation is that which is commonly found in tidal riverfront areas.

The water quality has gradually improved over the years to where now the water is suitable for activities such as fishing, boating and other activities involving limited contact with the water.

The existing views and public access to the river are numerous although some of them need improvement and/or development.

Special Areas

Introduction

Special Areas as defined in the New Jersey Coastal Management Program, New Jersey Department of Environmental Protection (NJDEP) are those 40 types of coastal areas which merit focused attention and special management policies. They are divided into Special Water Areas, Special Water's Edge Areas, Special Land Areas, and Coastwide Special Areas. Special Water Areas extend landward to the mean high water line. Special Water's Edge Areas extend from the mean high water line to one of the following: the inland limit of alluvial soils with a seasonal high water table equal to or less than one foot; the one hundred year flood hazard line; the inland limit of water's edge fill; or the inland limit of coastal bluffs, whichever is the most extensive. Special Land Areas are landward of the Water's Edge.

Nine types of special areas exist within the Study Area: Two Special Water Areas; Four Special Water's Edge Areas; One Special Land Area; and two Coastwide Special Areas. These are shown on Map #4 unless otherwise indicated.

Special Water Areas

Submerged Infrastructure Routes

Water, sewer, and gas pipelines and electric and telephone cables are all examples of Submerged Infrastructure Routes.

Sanitary sewer lines cross under the Rahway River in five places within the Study Area as shown on Map #3. Four of the locations are north of Milton Avenue and one is opposite Lennington Street at the downstream end of the Study Area.

Water lines cross the River at two places, both at the extreme downstream end of the Study Area. A future water line may cross the River at a point approximately opposite Witherspoon Street, but no definite plans have been drawn up at this point.

No gas, electric or telephone lines cross under the River at any point within the Study Area.

Marina Moorings

Marina Moorings are areas of water that provide mooring and boat maneuvering room as well as access to land and navigational channels for recreational boats. One Marina Mooring Area is located within the Study Area at the foot of Paterson Street and is the site of the Rahway Yacht Club.

Special Water's Edge Areas

Filled Water's Edge

Filled Water's Edge areas are existing filled areas lying between Wetlands or Water Areas, and either: (1) the upland limit of fill, or (2) the first public road or railroad landward of the adjacent Water Area, whichever is closer to the water. Nearly the entire Study Area consists of Filled Water's Edge with the exception of a small area north of Elizabeth Avenue, a small area at the south end of Essex Street, and a small area on either side of the River at the extreme downstream end of the River. All areas not shown as Wetlands or Natural Water's Edge-Floodplains on Map #4 are Filled Water's Edge.

Natural Water's Edge-Floodplains

Natural Water's Edge-Floodplains are the Flood Hazard Areas around rivers, creeks and streams as delineated by NJDEP under the Flood Hazard Area Control Act (N.J.S.A. 58:16A-50), or by the Federal Emergency Management Agency that are not included in other special Waterfront Areas such as Wetlands and Filled Water's Edge. The only Natural Water's Edge-Floodplains within the study area are located north of Elizabeth Avenue.

Intermittent Stream Corridors

Intermittent Stream Corridors are areas including and surrounding surface water drainage channels in which there is not a permanent flow of water. They are also called swales and ephemeral stream corridors. Two swales are located within the study area: one approximately 200 ft. downstream of U.S. Route 1 and the second approximately 350 ft. upstream of Paterson Street.

Special Land Areas

Steep Slopes

Steep Slopes are slopes in excess of 15%. Two significant areas exist within the Study Area. One is along the dike on the west bank of the River between East Hazelwood Avenue and Monroe Street. The other is along the southern bank of the River at the downstream end of the Study Area. Steep Slopes also occur intermittantly along the riverbank along East Hazelwood Avenue, Essex Street, and north of Monroe Street. These Intermittant Slopes are not shown on Map #4.

Coastwide Special Areas

Public Open Space

Public Open Space constitutes land areas owned and maintained by state, federal, county and municipal agencies or non-profit private groups and dedicated to conservation of natural resources, public recreation, or wildlife protection or management.

Two such areas exist in the Study Area. They are shown on Map #1 as Public Recreation Space, and are located in the triangle formed by the River, Elizabeth Avenue and West Grand Avenue, and on East Hazelwood Avenue between U.S. Route 1 and Main Street. Both parcels are passive recreation space and have no facilities.

Special Urban Areas

Special Urban Areas are those areas defined in urban aid legislation (N.J.S.A. 52:27D-178) which designate municipalities qualified to receive State aid to enable them to maintain and upgrade municipal services and offset local property taxes. This Special Area includes 21 coastal municipalities including Rahway.

ENGINEERING AND HYDRAULICS

INTRODUCTION

Purpose

The purpose of this investigation is to prepare recommendations for improvement to the Rahway River streambed and embankments south of Grand Avenue within the City of Rahway, Union County, New Jersey (See Location Plan). These improvements are to be compatable with concepts for a future waterfront land use and development program which will improve the river's recreational use, increase the river's ecology and restore the vitality of the river corridor zone.

Project Concepts

The project study area involves investigations such as erosion, siltation, illegal dumping, pollution, steep slope areas and odor problems. One major problem is that, during low tide conditions, a mud flat area is exposed in the vicinity extending from Milton Avenue to the Route 1 bridge. During warm weather, the exposed mud flats create an odor problem.

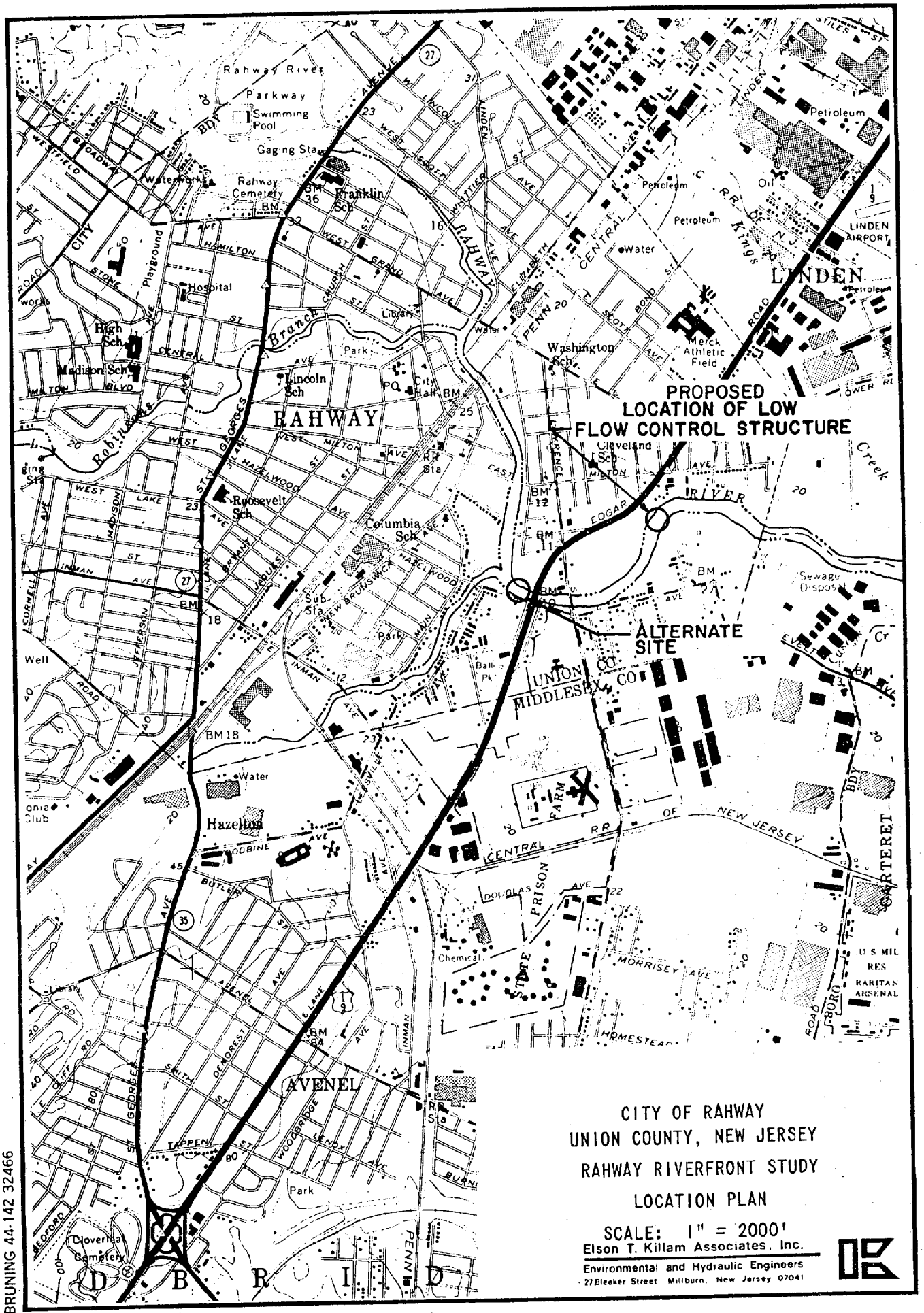
The City of Rahway desires to improve these conditions and enhance the recreational use of this reach of the river. Consideration is being given to the concept of constructing a small dam between the banks of the Rahway River in one of two locations, namely, downstream of Lawrence Street near Paterson Street or downstream of the confluence with the South Branch near Route 1. Construction of this dam would maintain a minimum water level in the affected area during low tide conditions. At the same time, this structure must not adversely affect the flood levels along the Rahway River or its tributaries.

EXISTING CONDITIONS

The State of New Jersey Department of Environmental Protection, Division of Water Resources, has provided copies of the floodway and flood hazard area delineation along the Rahway River in the City of Rahway. The plans, profiles, cross section data and computer data provided by the State has been reviewed and forms an essential part of the data base for this investigation. This data includes information pertaining to the riverbed elevation, the flood plain elevations, and the estimated flood levels for a range of storm frequencies. The delineated floodway and 100-year flood limits are shown on Map 5.

Stream Bed Elevations

Stream profiles of the Rahway River indicate that the low point of the riverbed near the downstream municipal boundary is approximately 7 feet below mean sea level. The river bottom remains fairly flat at this elevation until it reaches a point immediately downstream of the Lawrence Street Bridge. The low point in this area is approximately 2 feet below mean sea level. Between Route 1 and the confluence with the South Branch of the Rahway River, the minimum stream elevation is approximately 6 feet below mean sea level. From the confluence with the South Branch to the East


PROPOSED
LOCATION OF LOW
FLOW CONTROL STRUCTURE
ALTERNATE
SITE
RAHWAY
AVENEL
LINDEN
CITY OF RAHWAY
UNION COUNTY, NEW JERSEY
RAHWAY RIVERFRONT STUDY
LOCATION PLAN
SCALE: 1" = 2000'
Elson T. Killam Associates, Inc.
Environmental and Hydraulic Engineers
27 Bleeker Street Millburn, New Jersey 07041
BRUNING 44-142 32466

Milton Avenue Bridge, the riverbed raises to an elevation approximately 2 feet below mean sea level. Between East Milton Avenue and the upstream limit of the study area, namely, West Grand Avenue, there is a steady rise in the riverbed elevation, with the exception of a depression in the area between Elizabeth Avenue and the confluence with the Robinsons Branch of the Rahway River. Elevations of the riverbed in this reach are approximately 2 feet below mean sea level. For a complete description of the river profile, as well as the 100-year water surface profile, tide elevations and the proposed low flow control structure, see Plates 1 and 2 included in this report.

Flood Plain Elevations

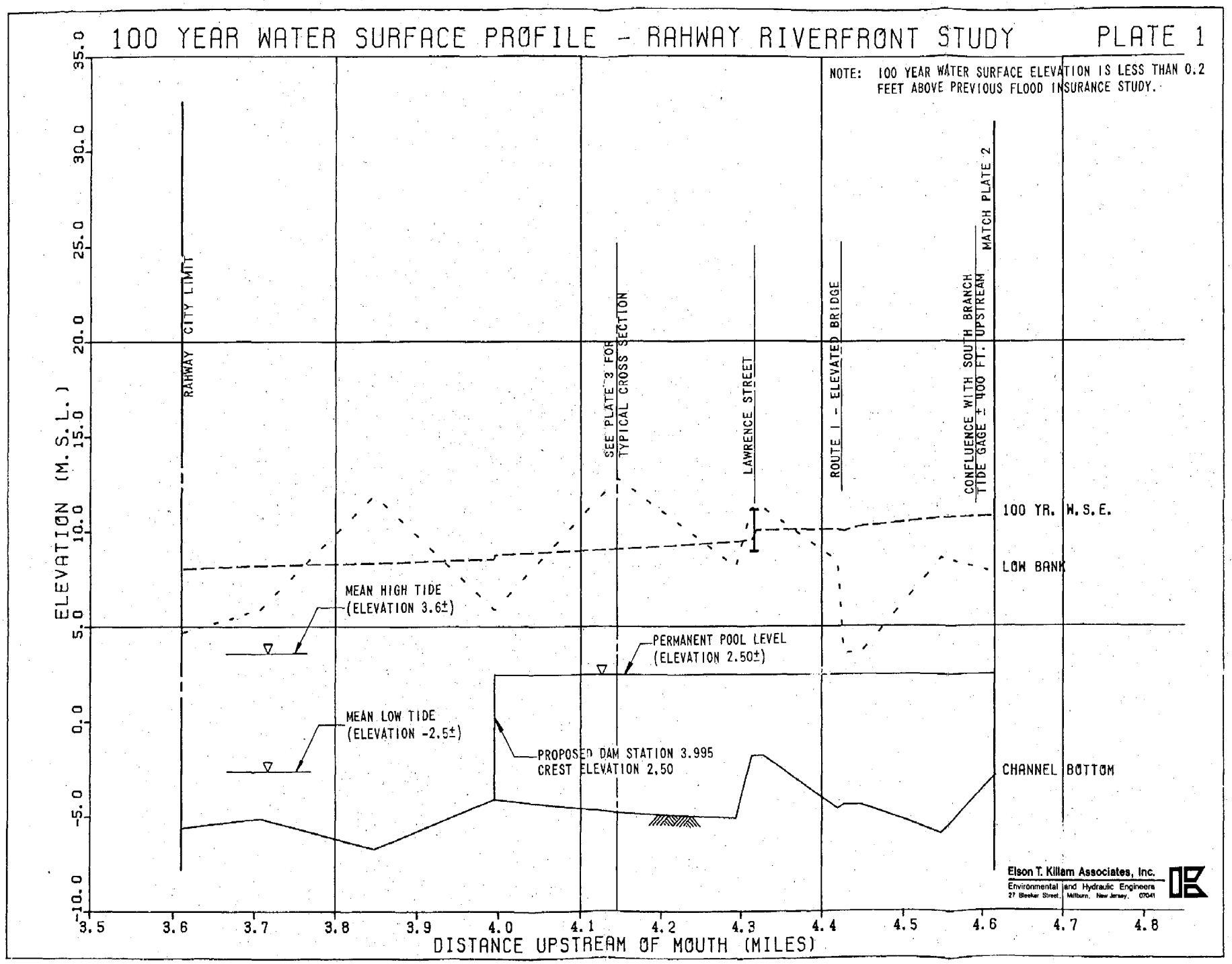
Based upon inspection of the Department of Environmental Protection Floodway and Flood Hazard Delineation Maps, two locations were analyzed as potential sites of the low flow control structure. Vacant land and wide flood plains in the areas upstream of Paterson Street and between Route 1 and the confluence with the South Branch have made them logical sites for the low flow control structure. River cross sections typical of these areas are shown on Plates 3 and 4.

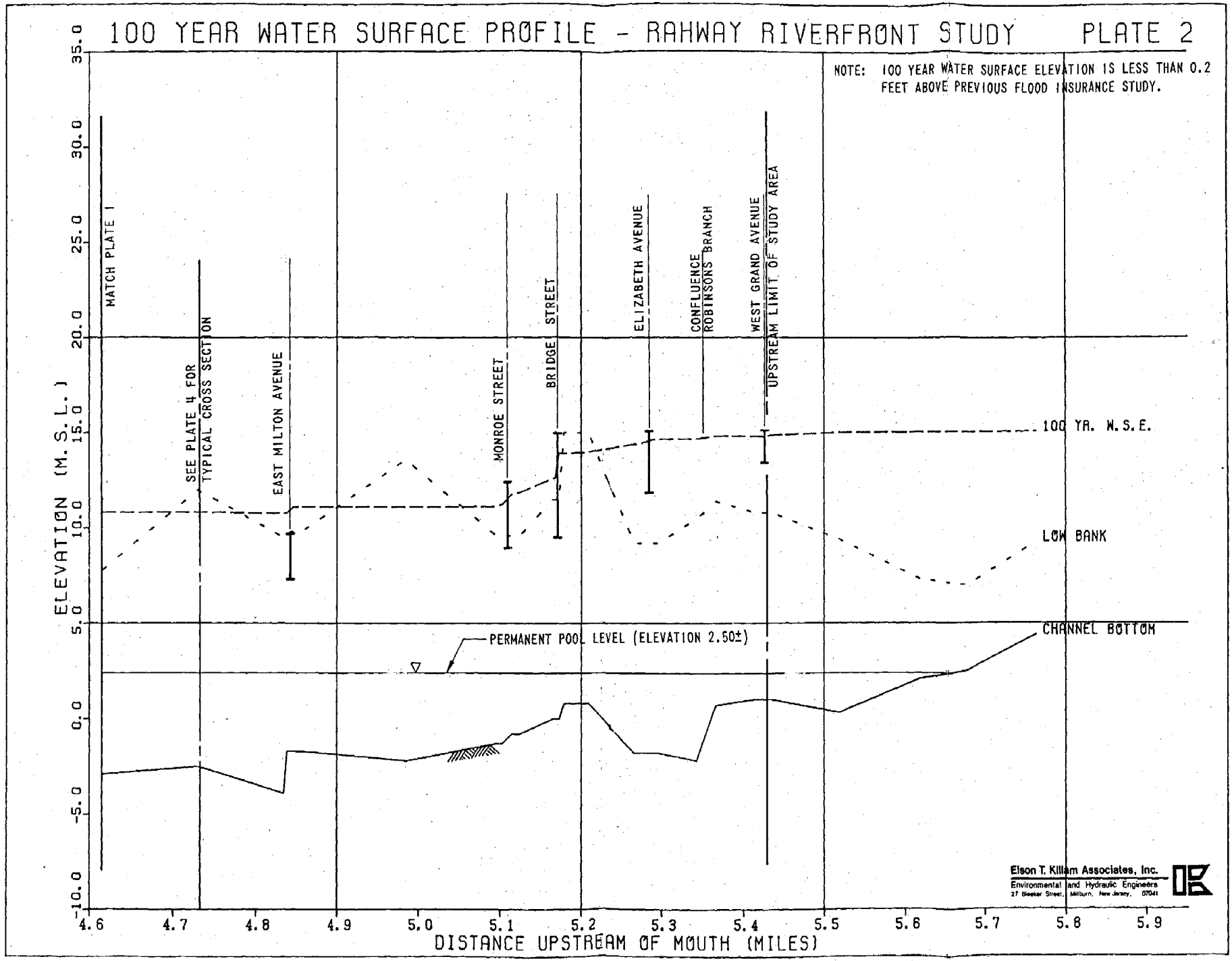
Based upon the above river profile data, under low tide and low flow conditions the Lawrence Street bridge acts as a control, resulting in a low water elevation approximately 2 feet below sea level. The riverbed between Route 1 and the confluence of the South Branch is lower than the bottom level at Lawrence Street, leaving a pool of water in this area even under low water conditions. However, as explained above, further upstream the bottom rises again to a point about 2 feet below sea level, or approximately the same elevation as the low point at the Lawrence Street Bridge. Therefore, very little water remains in this area, leaving the mud flats exposed in this wide portion of the Rahway River.

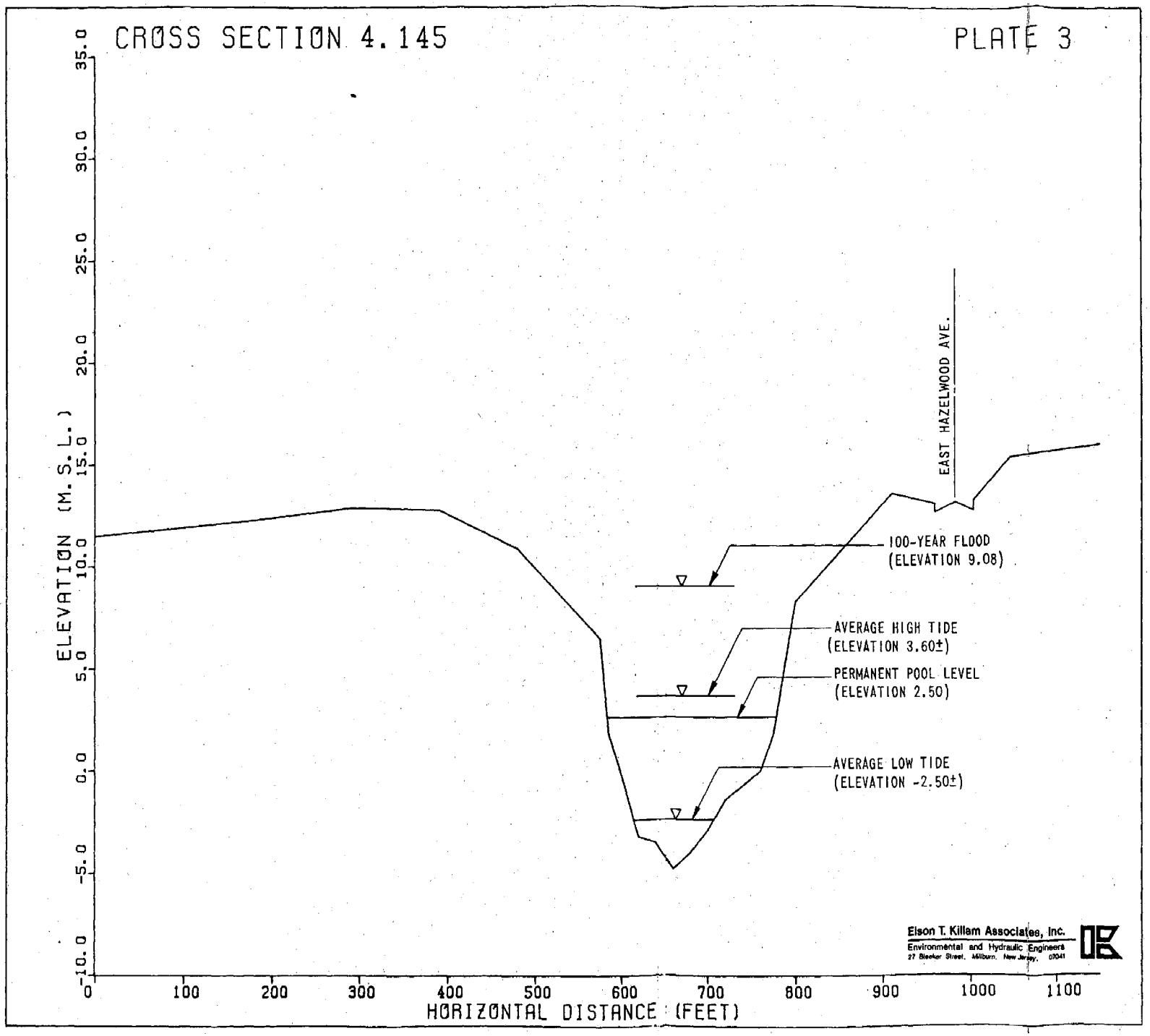
Based upon the riverbed profile data, it appears desirable to maintain a minimum water level at approximately elevation 2.5 feet above mean sea level from upstream of U.S. Route 1 to the upper limit of the project area near West Grand Avenue. A permanent water level at this elevation would provide a depth of approximately 4 feet from the control structure to East Milton Avenue, with a gradually decreasing depth proceeding upstream but still providing a minimum 1.5 feet of water at Bridge Street and at West Grand Avenue.

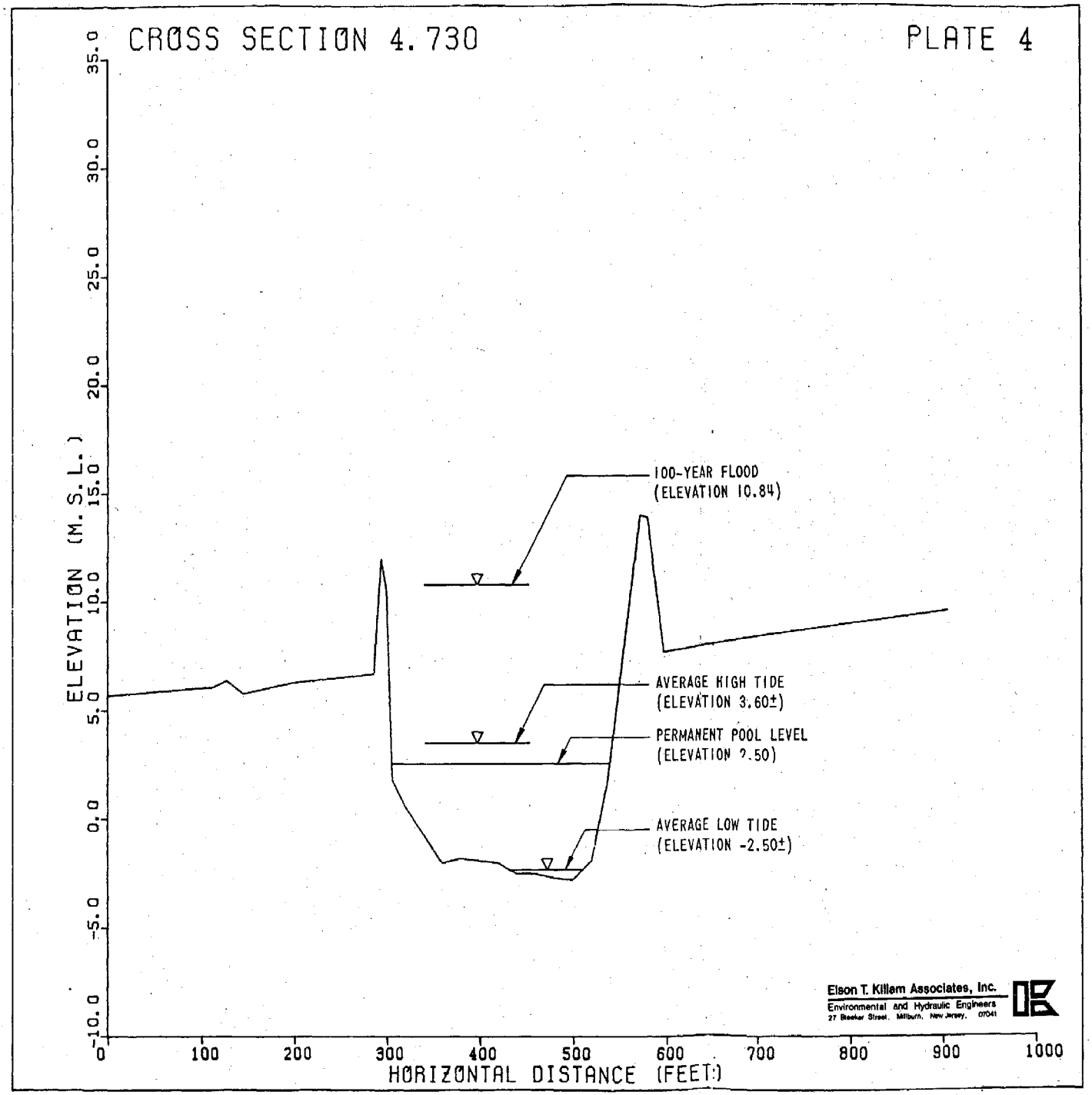
Estimated Flood Levels

Water surface profiles for a range of floods from the 10-year flood to the 500-year flood have been computed under the Flood Delineation Program. Table I presents the estimated peak flows and the computed peak water surface elevations for this range of flood frequencies. This information is representative of stream station 4.547, located upstream of the Route 1 crossing of the River. This site was initially selected as one of two locations for the low flow control structure due to the broad adjacent flood plain. Topographic data indicates that, in this area, the low bank of the stream is approximately at Elevation 4.4 feet above mean sea level,


100 YEAR WATER SURFACE PROFILE - RAHWAY RIVERFRONT STUDY
PLATE 1
NOTE: 100 YEAR WATER SURFACE ELEVATION IS LESS THAN 0.2 FEET ABOVE PREVIOUS FLOOD INSURANCE STUDY.
ELEVATION (M.S.L.)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
RAHWAY CITY LIMIT
SEE PLATE 3 FOR TYPICAL CROSS SECTION
LAWRENCE STREET
ROUTE 1 - ELEVATED BRIDGE
CONFLUENCE WITH SOUTH BRANCH TIDE GAGE ± 400 FT. UPSTREAM
MATCH PLATE 2
100 YR. W.S.E.
LOW BANK
MEAN HIGH TIDE (ELEVATION 3.6±)
PERMANENT POOL LEVEL (ELEVATION 2.50±)
MEAN LOW TIDE (ELEVATION -2.5±)
PROPOSED DAM STATION 3.995 CREST ELEVATION 2.50
CHANNEL BOTTOM
3.5
3.6
3.7
3.8
3.9
4.0
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
DISTANCE UPSTREAM OF MOUTH (MILES)
Elson T. Killam Associates, Inc.
Environmental and Hydraulic Engineers
27 Bleeker Street, Millburn, New Jersey, 07041


100 YEAR WATER SURFACE PROFILE - RAHWAY RIVERFRONT STUDY PLATE 2
NOTE: 100 YEAR WATER SURFACE ELEVATION IS LESS THAN 0.2 FEET ABOVE PREVIOUS FLOOD INSURANCE STUDY.
MATCH PLATE 1
SEE PLATE 4 FOR TYPICAL CROSS SECTION
EAST MILTON AVENUE
MONROE STREET
BRIDGE STREET
ELIZABETH AVENUE
CONFLUENCE ROBINSONS BRANCH
WEST GRAND AVENUE
UPSTREAM LIMIT OF STUDY AREA
100 YR. W.S.E.
LOW BANK
CHANNEL BOTTOM
PERMANENT POOL LEVEL (ELEVATION 2.50±)
ELEVATION (M.S.L.)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
4.6
4.7
4.8
4.9
5.0
5.1
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
DISTANCE UPSTREAM OF MOUTH (MILES)
Elson T. Killam Associates, Inc.
Environmental and Hydraulic Engineers
27 Bleeker Street, Millburn, New Jersey, 07041


CROSS SECTION 4.145
PLATE 3
ELEVATION (M.S.L.)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
EAST HAZELWOOD AVE.
100-YEAR FLOOD
(ELEVATION 9.08)
AVERAGE HIGH TIDE
(ELEVATION 3.60±)
PERMANENT POOL LEVEL
(ELEVATION 2.50)
AVERAGE LOW TIDE
(ELEVATION -2.50±)
0
100
200
300
400
500
600
700
800
900
1000
1100
HORIZONTAL DISTANCE (FEET)
Elson T. Killam Associates, Inc.
Environmental and Hydraulic Engineers
27 Bleeker Street, Millburn, New Jersey, 07041


CROSS SECTION 4.730
PLATE 4
ELEVATION (M. S. L.)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
100-YEAR FLOOD
(ELEVATION 10.84)
AVERAGE HIGH TIDE
(ELEVATION 3.60±)
PERMANENT POOL LEVEL
(ELEVATION ?.50)
AVERAGE LOW TIDE
(ELEVATION -2.50±)
0
100
200
300
400
500
600
700
800
900
1000
HORIZONTAL DISTANCE (FEET)
Elson T. Killam Associates, Inc.
Environmental and Hydraulic Engineers
27 Bleeker Street, Millburn, New Jersey, 07041

and the adjacent flood plain is at approximately Elevation 6. The flood plain in this area is not utilized for the 10-year and lesser floods due to the existance of a levee at Elevation 8.6.

TABLE I

RAHWAY RIVER DELINEATIONS
PEAK FLOOD ESTIMATES

STATION 4.547 MILES
UPSTREAM OF MOUTH

Flood Frequency (Years)	Peak Flow (Cubic feet per second)	Peak Flood Elevation (Feet above mean sea level)
10	5,160	7.63
50	9,100	9.36
100	11,670	10.59
500	19,300	13.71

The second analysis point for the low flow control structure was at Station 3.995, in the vicinity of Paterson Street, upstream of the Yacht Club. Topographic data indicates that, in this area, the low bank of the stream is at approximately elevation 11.9 feet above mean sea level. As indicated in Table II, not even the 500-year flood is higher than elevation 11.9 and therefore the flood is contained within the banks of the river.

TABLE II

RAHWAY RIVER DELINEATION
PEAK FLOOD ESTIMATES

STATION 3.995 MILES
UPSTREAM OF MOUTH

Flood Frequency (Years)	Peak Flow (Cubic feet per second)	Peak Flood Elevation (Feet above mean sea level)
10	5,160	6.95
50	9,100	7.91
100	11,670	8.56
500	19,300	10.39

Tidal Data

Investigations have been undertaken by various agencies in order to estimate the 100-year tide level in Newark Bay and the Arthur Kill. While the

specific elevations determined under the individual studies have varied somewhat, the general indication is that the 100-year flood level in this area is approximately 10 feet above sea level. The topographic maps indicate that the lower areas near the Rahway River in the vicinity of Essex Street and Sherman Street would be inundated with a tide at this elevation, even without coincident flood flows on the Rahway River.

A review has been made of existing tidal data for non-storm conditions. The City of Rahway maintains two tide gages within the study area, namely, at the East Hazelwood Avenue Bridge (approximately 400± feet upstream of the confluence with the South Branch) and at the Monroe Street Bridge. Additional data was obtained for the Army Corps of Engineers tide gage on the Arthur Kill in Perth Amboy. This gage is maintained by Rutgers University Department of Geology.

Analysis of this data from January 1979 through December 1980 indicates an average high tide of approximately 3.6 feet above mean sea level and an average low tide of about 2.5 feet below mean sea level or a daily variation of approximately 6 feet.

Under existing conditions, the water level upstream of Route 1 will depend upon the downstream tide elevation as well as the quantity of base flow in the Rahway River. During periods of low base flow, it can reasonably be expected that the water level will drop to approximately the elevation of the riverbed at Lawrence Street, which is approximately 2 feet below sea level. Under these conditions the mud flats will be exposed in the reach of the Rahway River between the confluence with the South Branch and East Milton Avenue.

PROPOSED PROJECT

The proposed project would provide for control of low flows within the study area. A low flow control structure would be built across the river at one of the two previously mentioned sites.

Control Structure Description

The proposed structure would have a crest elevation of approximately 2.5 feet above mean sea level. At Station 3.995, the length of the structure would be approximately 240 feet and at Station 4.547 the structure would be approximately 175 feet long. River profiles at these two sites indicate that riverbed elevations are 4.1 feet and 5.9 feet below mean sea level for Stations 3.995 and 4.547 respectively. Therefore, the structure would vary in height from 6.6 feet to 8.4 feet above the existing streambed. Further upstream, the low point in the riverbed is approximately 2 feet below sea level. Therefore, the proposed structure would provide an impoundment depth of approximately 4 feet upstream to East Milton Avenue.

The proposed low flow control structure would include appropriate abutments tying it into the adjacent banks and a gate structure to permit lowering of the upstream water level to facilitate cleaning or for other purposes.

Initial investigations included consideration of an inflatable type dam which could be deflated under flood conditions. However, maintenance problems, including the potential for damage by vandalism, and the results of hydraulic analyses (described below), indicating that the structure would not adversely affect upstream flood levels, both favor the installation of a fixed facility rather than a movable facility. Therefore, at this stage in the investigation, the most appropriate means of providing the low flow control appears to be a concrete weir constructed across the Rahway River with control gates to permit lowering of the upstream water surface. On the basis of preliminary cost estimates, it does not appear that the inflatable dam would result in a lower construction cost, but would result in higher operation and maintenance costs. Therefore, at this juncture it is recommended that consideration be given to a permanent fixed structure as described above.

Hydraulic Analysis

For the analysis of potential flooding problems which could be caused by the proposed dam structure, the Army Corps of Engineers - Hydrologic Engineering Center Computer Program HEC-2 Water Surface Profiles was utilized. This program computes water surface profiles for river channels under various flow conditions.

The input data from an existing New Jersey Department of Environmental Protection Flood Delineation Study was utilized to be consistent with previous studies performed on the Rahway River. Modifications were made to the input data to simulate the constructions of a dam in the two locations and a variety of different dam heights.

From the initial investigations, it was determined that construction of the dam at Station 3.995 and Station 4.547 yielded similar results. Because of this similarity, Station 3.995 was chosen because it provided benefits for a greater length of the River. As such, all further references to the dam pertain to a dam with a crest elevation of 2.5 feet above mean sea level at a distance 3.995 miles above the mouth of the river. Each time the dam height was varied, key parameters were examined to determine the impact of the dam on previously computed flood levels. The following table gives a comparative listing of existing and proposed flood elevations at different locations due to construction of the dam with a crest elevation of 2.5 feet above mean sea level.

TABLE III

Location: 800+ Feet Upstream of Proposed Dam Site (Station 4.145)

Flood Intensity	Existing Water Surface Elevation*	Proposed Water Surface Elevation*
10 Year	7.11	7.21
50 Year	8.20	8.37
100 Year	8.90	9.08
500 Year	10.77	10.94

Location: 160± Feet Upstream of Confluence with South Branch (Station 4.616)

Flood Intensity	Existing Water Surface Elevation*	Proposed Water Surface Elevation*
10 Year	7.70	7.78
50 Year	9.46	9.57
100 Year	10.69	10.82
500 Year	13.80	13.87

Location: West Grand Avenue - Limit of Study Area (Station 5.434)

Flood Intensity	Existing Water Surface Elevation*	Proposed Water Surface Elevation*
10 Year	9.34	9.39
50 Year	12.94	12.99
100 Year	14.81	14.87
500 Year	18.11	18.14

* Datum - Mean Sea Level Sandy Hook, New Jersey

As shown in Table III, the increase in the 100-year flood level ranges from 0.18 feet just upstream of the dam to 0.06 feet at the study area limit. Similarly, the increase in the 500-year flood level ranges from 0.17 feet to 0.03 feet. Therefore, it would appear that the structure would not adversely affect flood levels upstream on the Rahway River or its tributaries. Lower intensity storms would not cause the river to overflow its banks more than currently exists.

RIVER IMPROVEMENTS

Dredging

Dredging will be necessary at several locations within the Study Area. The most important area will be the docking and equipment storage area for any proposed recreational facilities. Other areas where dredging would be beneficial are as follows:

- Upstream and downstream of Center Pier and abutments of East Milton Avenue Bridge.

- Within the pool area between the confluence with the South Branch and East Milton Avenue.

- The north bank, downstream of the confluence with the South Branch.

- Upstream and downstream of the Lawrence Street Bridge.

Erosion Control

The Army Corps of Engineers has done extensive flood control work in this area of the Rahway River. The banks of the river have been rip-rapped in areas where erosion control is necessary. Additional erosion control would be necessary along the river banks adjacent to the proposed dam structure. The river bottom downstream of the dam would also require rip-rap to prevent excessive erosion.

River Cleaning

Extensive cleaning within the Study Area would be necessary. Both man-made and natural debris litter the area. In addition, nearby vacant and commercially owned lots should be cleared of any dumped refuse. Minor cleaning will be necessary after a heavy rainfall to remove large natural debris (i.e. tree limbs) carried by large flows within the river.

Maintenance

The proposed low flow control structure will create a permanent impoundment. It is the nature of impoundments to accumulate silt and sediment due to the reduced velocity in the ponding area. The situation is somewhat different in this case.

During storms, the water level will be no higher than that which exists under present conditions. Velocities will be the same; therefore, the amount of sediment deposited will generally be about the same as that deposited without the permanent impoundment. Additional deposition can be expected immediately upstream of the structure, in the area of reduced velocity near the upstream base of the dam. Periodic cleaning may be required to keep the outlet gates clear. These gates would normally be closed and would only be opened to drain the upstream area for cleaning or other purposes. In order to reduce the need for cleaning upstream of the gates, it may be practical to leave the gates partially opened with a small flow keeping the sediment moving through the gates.

It must be recognized that the proposed dam is a low flow control structure intended to keep the water in the river during low tide periods. Water will flow upstream back over the structure during a part of each day under normal high tide conditions, since high tide at Elevation 3.6 feet is approximately one foot over the top of the proposed structure. Therefore, the areas upstream of the dam will still be subject to daily tidal fluxuations, but over a smaller range, with a higher low water elevation controlled by the dam.

DAM CONSTRUCTION COST ESTIMATE

Low Flow Control Structure

Description	Estimated Cost
Excavation and Backfill (including rock)	34,000
Placement of Concrete Wall and Gate Structure	127,000
Fill Construction Method (1) Dewatering Wellpoint System	97,000
Rip-Rap	8,000
15% Contingency	39,900
Total Construction Cost	$305,900
Legal, Engineering, Permits, Etc. (Allow 25%)	76,500
TOTAL PROJECT COST	$382,400

(1) The fill construction method involves placing fill in an area larger than required and then excavating in drier conditions using a wellpoint system.

A second alternative would involve construction of a cofferdam system. This would include driving sheet piling in addition to the wellpoint system. Comparison of this method versus the fill method revealed that the cofferdam system would be far more expensive.

COMPARISON OF CONSTRUCTION METHODS

DESCRIPTION	ESTIMATED COST	
	FILL METHOD	COFFERDAM METHOD
Excavation and Backfill	34,000	29,000
Placement of Concrete Wall and Gate Structure	127,000	127,000
Dewatering Wellpoint System	97,000	97,000
Mobilization of Pile Driving Rig	-	30,000
Place and Extract Sheet Piling	-	54,600
Rip Rap	8,000	8,000
Total Project Cost Including Contingencies, Legal, Engineering, Permits, Etc.	$382,400	$496,800

Dredging/Clearing and Desnagging

Description	Estimated Cost
East Milton Avenue and Lawrence Street Bridges	$ 2,500
Reach within Main Pool Area	5,500
15% Contingency	1,200
Mobilization	1,000
Total Dredging Cost	10,200
Legal, Engineering, Permits, Etc. (Allow 15%)	1,530
TOTAL PROJECT COST	$11,730

PERMITS

Federal and State permits will be required prior to implementation of the project. Preliminary results of the hydrologic and hydraulic analyses for the two alternate sites for the low flow control structure were sent to the Army Corps of Engineers and the New Jersey Department of Environmental Protection (NJDEP). Conceptual approval has been received from both agencies.

Conceptual approval by NJDEP was based upon the condition of no adverse effect on upstream flooding.

Corps of Engineers conceptual approval was based on the condition that the City maintain existing drainage structures and flap gates of the Corp project on the South Branch of the Rahway River. Assurances to that effect have been given to the Corps and, in addition, the City is under contract to the U.S. Government to provide such maintenance.

In addition to a dam permit from NJDEP and a permit from the Corps of Engineers, a Water Quality Certification will be required from NJDEP, a Soil Erosion and Sediment Control Plan certification from the local Soil Conservation District office, and possibly a Riparian Permit from NJDEP.

The permits, agencies and addresses are as follows:

Dam Permit:	NJDEP Division of Water Resources Bureau of Flood Plain Management P.O. Box CN-029 Trenton, N.J. 08625 (609) 292-4869
Corps Permit:	U.S. Army Engineers, NY District 26 Federal Plaza New York, N.Y. 10278 Attn: NANOP-E (212) 264-0184
Water Quality Certification:	NJDEP Division of Water Resources P.O. Box CN-029 Trenton, N.J. 08625 (609) 292-6215
Riparian Permit:	NJDEP Division of Marine Services P.O. Box 1889 Trenton, N.J. 08625 (609) 292-2573
Soil Erosion and Sediment Control Plan Certification:	Somerset-Union SCD 308 Milltown Road Bridgewater, N.J. 08807 (201) 725-3848

SUMMARY AND RECOMMENDATIONS

Aesthetic conditions along the Rahway River can be improved and recreational use can be encouraged through a program of limited improvement of the river. The proposed project includes construction of a low flow control structure across the river near Paterson Street, and minor cleaning and dredging of the river, particularly near the East Milton Avenue and Lawrence Street bridges.

The low flow control structure would consist of a low concrete dam, approximately 240 feet long and 6.6 feet higher than the existing stream bed. A gate structure would permit lowering of the upstream water level to facilitate cleaning or for other purposes. The crest elevation would be at approximately elevation 2.5 feet above mean sea level, creating a permanent pool slightly lower than the mean high tide (elevation + 3.6 feet), but significantly higher than the mean low tide (elevation - 2.5 feet). The mud flats presently visible during low tide under existing conditions would be inundated by the permanent pool. Water based recreational activities, such as canoeing and boating, would be made possible by the creation of this permanent pool.

Detailed hydraulic analyses were undertaken, utilizing the Army Corps of Engineers' HEC-2 computer program and based upon the cross sections and downstream water levels developed in the Rahway Flood Insurance Study.* These analyses indicate that the proposed structure will raise the peak flood levels upstream by less than 0.2 feet for the 10-, 50-, 100-, and 500-year floods. Therefore, the proposed structure will not have any significant adverse effect on upstream flooding.

The preliminary hydrologic and hydraulic findings for the initial site selected for analyses, located upstream of Route 1, were sent to the Army Corps of Engineers (New York District) and the New Jersey Department of Environmental Protection. The latter agency has replied, indicating conceptual approval. No reply has been received from the Corps of Engineers (See Appendix B for copies of correspondence).

The State's conceptual approval is based upon the condition of no adverse effect upon flood conditions. Therefore, it is reasonable to expect that similar approval would be granted for the recommended downstream location near Paterson Street, since the effects are similar. The downstream location is recommended since it will provide benefits for a greater length of the river.

Project costs are estimated as follows (including an allowance for legal, engineering and contingencies):

Low flow control structure	$ 382,400
Dredging, Clearing/Desnagging	11,730
TOTAL	$ 394,130

These costs are exclusive of the cost of any required easements.

*SOURCE - Federal Emergency Management Agency.

Following review of this report by the City of Rahway and the New Jersey Department of Energy, the following steps should be taken if implementation of the project is desired:

1. Forward copies of the final report to the New Jersey Department of Environmental Protection and the U.S. Army Corps of Engineers to confirm conceptual approval of the project.

2. Prepare preliminary plans for the low flow control structure and river dredging, cleaning and desnagging.

3. Hold appropriate local public meetings.

4. Submit applications for the required Federal and State permits, based upon the preliminary plans. Initiate actions to obtain required easements.

5. Undertake detailed design investigations (surveys, soils investigations) and complete detailed design plans and specifications.

6. Finalize permits, easements, and proceed to construction.

APPENDIX A

APPENDIX A

LIST OF CONTACTS

CONTACT	COMPANY OR AGENCY	PHONE NUMBER
Mr. Charles Defendorf	NJDEP Bureau of Flood Plan Mgtmt.	(609) 292-2296
Mr. Edward Wolf	Goodyear Rubber Products Akron, Ohio	(216) 796-2812
Mr. Sutton	Goodyear Aerospace Products Rockmart, Georgia	(404) 684-7855
Mr. Chris Attaway	Firestone Rubber Products Magnolia, Arkansas	(501) 234-3381
Mr. Norm Tabor	N.H. Imbertson Company Burbank, California	(213) 849-1207
Mr. Jack Hartwell	Staff Industries Inc. Lakewood, New Jersey	(201) 364-7509
Mr. Jim Bartlett	Watersaver Company Inc. Cliffwood Beach, New Jersey	(201) 566-2252
Mr. Herb Southern	Southern Associates, Arch. E. Hazelwood Avenue, Rahway	(201) 388-5298
Mr. Bob Shopp	US Geological Survey Trenton, New Jersey	(609) 989-2162
Dr. Gale Ashley Mr. Bill Renwick	Rutgers University	(201) 932-2221 (201) 932-7836
Mr. John Moyle	NJDEP Dam Analysis Section Bureau of Flood Plain Mgmt.	(609) 292-2296
Mr. Steve Lyles	National Oceanic Survey Branch of the Commerce Department	(301) 443-8467
Mr. Paul Leso	City of Rahway Eng. Dept.	(201) 381-8000
Mr. Frank Santomauro	U.S. Army Corps of Engineers	(212) 264-9086
Mr. Frank Petrik Mr. Joseph Shukis	Union County Engineering Dept.	(201) 232-7010

APPENDIX B

Elson T. Killam Associates, Inc.

27 Bleeker Street, Millburn, New Jersey 07041 Environmental and Hydraulic Engineers

• Telephone: (201) 379-3400 • Telex: 642-057 ETK ASSOC MIBN

Leo J. Coakley, P.E.
Senior Associate

PLEASE REPLY TO:
P.O. Box 1008
Millburn, NJ 07041

October 21, 1981

State of New Jersey
Department of Environmental Protection
Division of Water Resources
Bureau of Flood Plain Management
P.O. Box CN-029
Trenton, NJ 08625

Attention: Mr. John O'Dowd, P.E.

Re: 851 - Rahway River Low Flow Control Structure, City of Rahway Union County, N.J.

Gentlemen:

Enclosed please find copies of an "Interim Report, Rahway Riverfront Study, Hydraulics Summary" describing a proposed low flow control structure on the Rahway River upstream of U.S. Route 1 in the City of Rahway, New Jersey.

We have been requested by the Planner for City of Rahway to investigate the feasibility of constructing a control structure in this area to maintain a minimum water level in the Rahway River upstream of Route 1 under low tide conditions. Under existing conditions, with low tide, the water level drops significantly in this area, leaving exposed mud flats. The problem is further aggravated in warm weather by the odors coming from the exposed river bottom.

Our investigations to date have indicated that it would be desirable to construct a concrete weir with a crest elevation 2 feet above sea level, and a length of approximately 175 feet, at a point between U.S. Route 1 and the confluence with the South Branch of the Rahway River. Enclosed please find copies of a portion of the applicable U.S.G.S. quad sheet and a topographic map at 1"=200', showing the approximate location of the proposed structure.

We would appreciate review of the proposed concept by your agency. We would further appreciate the opportunity to review this project with you with respect to the prospects for obtaining the appropriate permits for a project of this nature. We are concurrently communicating with the New York District, Corps of Engineers to obtain input from that agency.

The planning study has been funded under a grant by the New Jersey Department of Energy. In order to meet the timetable associated with this grant, we would appreciate your early attention to this matter and would further appreciate the opportunity to meet with you in the next few weeks. We have included extra

copies of this letter and enclosures for your convenience for distribution to the appropriate personnel.

Please do not hesitate to call if you have any questions or require any additional information. Thank you in advance for your cooperation and attention in this matter.

Very truly yours,

ELSON T. KILLAM ASSOCIATES, INC.

Leo J. Coakley

LJC:bah

cc: Robert Rosa

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WATER RESOURCES
P. O. BOX CN 029
TRENTON, NEW JERSEY 08625

ARNOLD SCHIFFMAN
DIRECTOR

RECEIVED
DEC 3 1981
ELSON T. KILLAM ASSOCIATES, INC.
ENVIRONMENT & HYDRAULIC ENGINEERS

Elson T. Killam Associates, Inc.
27 Bleeker Street
Millburn, New Jersey 07041

DEC 1 1981

Re: Rahway River Low Flow Control
Stream File No. 2013-81

Dear Mr. Coakley:

This is with reference to your letter of October 21, 1981 regading the proposed construction of a concrete dam across the Rahway River at a location 300 feet upstream from the Route I crossing in the City of Rahway, Union County, New Jersey.

Please be advised that a review of the Interim Report Rahway Riverfront Study Hydraulic Summary a conceptual approval is hereby granted.

This approval is a conceptual approval only and is not, nor should it in any way be construed as, a final approval of this project. The Department reserves the right to deny final approval at any state of the process for cause. NOR SHOULD THIS CONCEPTUAL APPROVAL BE DEEMED TO PREEMPT THE RESPONSIBILITY OF LOCAL GOVERNMENT TO REVIEW THIS PROJECT IN ACCORDANCE WITH ALL LOCAL REVIEW AND APPROVAL REQUIREMENTS. A conceptual approval represents a limited review of the project based upon incomplete technical data and those regulatory requirements in existence at the time of the application and known to apply at the time of the approval. The Department may deny any final approval for cause which may include but is not limited to the following:

1. Local government denial;

2. New technical facts which the Department becomes aware of after the conceptual approval;

Refer L.S.C.	Refer Back To
Date Seen	
Date Answered	
Under Study By	

New Jersey Is An Equal Opportunity Employer

3. Any regulatory requirements which are established before final approval;

4. Any existing requirement or regulation or law not considered at the conceptual approval state.

Please have a representative of your office arrange a pre-application conference with this office so that design requirements may be addressed prior to the development of the final design.

Enclosed is an application package for a dam permit.

If you have any further questions, please advise.

Very truly yours,

John Moyle

John Moyle
Dam Analysis Section
Bureau of Flood Plain Management

JM:FPM-2:T

cc: Rahway City Engineer & Clerk
Union County Engineer

Elson T. Killam Associates, Inc.

27 Bleeker Street, Millburn, New Jersey 07041 Environmental and Hydraulic Engineers

• Telephone: (201) 379-3400 • Telex: 642-057 ETK ASSOC MIBN

Leo J. Coakley, P.E.
Senior Associate

March 5, 1982

State of New Jersey
Department of Environmental Protection
Division of Water Resources - Dam Analysis Section
P.O. Box CN-029
Trenton, New Jersey 08625

Attention: Mr. John Moyle

Re: Rahway River Low Flow Control Structure - Job #85100

Gentlemen:

Enclosed please find a copy of the draft report for the proposed Rahway Riverfront Study (Hydraulics Section only). The hydraulics portion of the report investigates the effect of the proposed dam on the 100-year flood levels in the Rahway area.

In a letter dated December 1, 1981 (included in Appendix B), your agency granted conceptual approval of the low flow control structure. Since that time, the site of the structure has been changed and the analysis revised.

The New Jersey Department of Energy, for whom this report is being prepared, would appreciate a re-review of the analysis based on the revised location. We would further appreciate the opportunity to review this project with you with respect to the prospects for obtaining the appropriate permits for a project of this nature.

We have recently contacted Mr. Sam Tosi, of the New York District of the Corps of Engineers (See Appendix B) to obtain input from that agency.

In order to meet the timetable associated with the Department of Energy grant, we would appreciate your early attention in this matter. If you should need any additional information, please do not hesitate to call us.

Thank you in advance for your cooperation and attention to this matter.

Very truly yours,

ELSON T. KILLAM ASSOCIATES, INC.

Leo J. Coakley

LJC:cmv

cc: Robert Rosa ✓

Enclosures

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
P. O. BOX CN 029
TRENTON, NEW JERSEY 08625

ARNOLD SCHIFFMAN
DIRECTOR

AUG 12 1982

RECEIVED
AUG 16 1982
ELSON T. KILLAM ...
ENVIRONMENT & HYDRAULIC ENGINEERS

Elson T. Killam Associates, Inc.
27 Bleeker Street
Millburn, NJ 07041

Re: Rahway River Low Flow Structure
Stream File No. 2013-82

Dear Mr. Coakley:

This is with reference to my recent conversation with your office regarding the revised Rahway Riverfront Study for the proposed construction of a small dam located across the Rahway River at a location approximately 2800' downstream from the Route 1 crossing in the City of Rahway, Union County, New Jersey.

Please be advised that an additional review of the undated report, entitled Rahway Riverfront Study a conceptual approval is hereby granted. It must be noted that the conditions outlined in my letter dated December 1, 1981 still apply for this conceptual approval.

Should you like to arrange a pre-application conference with this office to discuss design requirements, please contact me at (609) 292-2402.

Very truly yours,

John H. Moyle
John H. Moyle
Dam Analysis Section
Bureau of Flood Plain Management

JHM/ts
cc: Rahway City Eng. & Clerk
Union County Engineer

Refer ...	... Back To ...
Date Seen ...	
Date Answered ...	
Under Study By ...	

Elson T. Killam Associates, Inc.

27 Bleeker Street, Millburn, New Jersey 07041 Environmental and Hydraulic Engineers

• Telephone: (201) 379-3400 • Telex: 642-057 ETK ASSOC MIBN

Leo J. Coakley, P.E.
Senior Associate

PLEASE REPLY TO:
P.O. Box 1008
Millburn, NJ 07041

October 21, 1981

New York District
Corps of Engineers
26 Federal Plaza
New York, NY 10278

Attention: NANOP-E

Re: 851 - Rahway River Low Flow Control Structure, City of Rahway Union County, N.J.

Gentlemen:

Enclosed please find copies of an "Interim Report, Rahway Riverfront Study, Hydraulics Summary" describing a proposed low flow control structure on the Rahway River upstream of U.S. Route 1 in the City of Rahway, New Jersey.

We have been requested by the Planner for City of Rahway to investigate the feasibility of constructing a control structure in this area to maintain a minimum water level in the Rahway River upstream of Route 1 under low tide conditions. Under existing conditions, with low tide, the water level drops significantly in this area, leaving exposed mud flats. The problem is further aggravated in warm weather by the odors coming from the exposed river bottom.

Our investigations to date have indicated that it would be desirable to construct a concrete weir with a crest elevation 2 feet above sea level, and a length of approximately 175 feet, at a point between U.S. Route 1 and the confluence with the South Branch of the Rahway River. Enclosed please find copies of a portion of the applicable U.S.G.S. quad sheet and a topographic map at 1"=200', showing the approximate location of the proposed structure.

We would appreciate review of the proposed concept by your agency. We would further appreciate the opportunity to review this project with you with respect to it's relationship to existing or proposed Corps of Engineers projects, as well as the prospects for obtaining the appropriate permits for a project of this nature.

The planning study has been funded under a grant by the New Jersey Department of Energy. In order to meet the timetable associated with this grant, we would appreciate your early attention to this matter and would further appreciate the opportunity to meet with you in the next few weeks. We have included extra copies of this letter and enclosures for your convenience for distribution to

the appropriate Corps personnel.

Please do not hesitate to call if you have any questions or require any additional information. Thank you in advance for your cooperation and attention in this matter.

Very truly yours,

ELSON T. KILLAM ASSOCIATES, INC.

Leo J. Oakley

LJC:bah

cc: Robert Rosa

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
26 FEDERAL PLAZA
NEW YORK, N. Y. 10278

REPLY TO
ATTENTION OF:

NANOP-E

15 January 1982

Application No. 81-830

Elson T. Killam Associates, Inc.
City of Rahway
c/o Leo J. Coakley, P.E.
P.O. Box 1008
Millburn, NJ 07041

RECEIVED
JAN 20 1982
ELSON T. KILLAM ASSOCIATES, INC.
ENVIRONMENT & HYDRAULIC ENGINEERS

Dear Mr. Coakley:

Reference is made to your letter dated 21 October 1981 requesting a determination for the need of a Department of the Army permit to construct improvements to the stream bed and embankments in the Rahway River upstream of U.S. Route 1 of the City of Rahway, Union County, New Jersey.

Pursuant to Federal laws enacted for the preservation and protection of navigable waterways and waters of the United States, a Department of the Army permit is required for your proposed work.

An application for a permit consists of a completed form ENG 4345 and its supplment form NANY-201. The completed forms should be accompanied by a set of color photographs showing the project area and a set of drawings prepared in accordance with the instructions and sample drawings contained in the inclosed booklet. The photographs should be identified (i.e., direction of view, time and date taken, etc.) and keyed to a map of your work site showing the proposed work. One set of original reproducible drawings (8 1/2" x 11" in size with a 1" margin along the top 8 1/2" side) and three sets of copies are required. The names and addresses of owners of property adjoining your proposed work must be indicated on the application form and on the drawings.

The foregoing represent the requirements of the Department of the Army to process an application for a permit. Appropriate state and local authorities should also be contacted to determine the extent of their jurisdictions. A listing of state regulatory offices is inclosed for your use.

Sincerely,

Bart DeMartino

BART DEMARTINO
Area Manager
Construction Permits Section

Incl
Booklet (w/Application)

Elson T. Killam Associates, Inc.

27 Bleeker Street, Millburn, New Jersey 07041 Environmental and Hydraulic Engineers

▪ Telephone: (201) 379-3400 ▪ Telex: 642-057 ETK ASSOC MIBN

Leo J. Coakley, P.E.
Senior Associate

PLEASE REPLY TO
P.O. Box 1008
Millburn, NJ 07041

February 19, 1982

Department of the Army
New York District
26 Federal Plaza
New York, NY 10278

Attention: Mr. Sam Tosi

Re: 851 - Rahway River Low Flow Control Structure, City of Rahway Union County, New Jersey

Gentlemen:

Enclosed please find a draft report for the proposed Rahway Riverfront Study (Hydraulics Section only). The hydraulics portion of the report investigates the effect of the proposed dam on the 100-year flood levels in the Rahway area.

In a letter dated October 21, 1981, sent to the Corps, we recommended a location upstream of the Route 1 bridge as being the proposed site of the low flow control structure. Since that time further analysis showed a site downstream to be more desirable. As such, we would appreciate review of the proposed concept by your agency. We would further appreciate the opportunity to review this project with you with respect to its relationship to existing or proposed Corps of Engineers projects, as well as the prospects for obtaining the appropriate permits for a project of this nature.

Please do not hesitate to call if you have any questions or require any additional information. Thank you in advance for your cooperation and attention in this matter.

Very truly yours,

ELSON T. KILLAM ASSOCIATES, INC.

Leo J. Coakley, P.E.

LJC:kad

cc: Robert Rosa

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
26 FEDERAL PLAZA
NEW YORK, N. Y. 10278

REPLY TO
ATTENTION OF:

NANPL-FA

20 APR 1982

RECEIVED
APR 22 1982
ELSON T. KILLAM ASSOCIATES, INC.
ENVIRONMENTAL & HYDRAULIC ENGINEERS

Elson T. Killam Associates, Inc.
27 Bleeker Street
Millburn, New Jersey 07041

Gentlemen:

We have completed a review of the Hydraulics Section of your draft report for the proposed Rahway Riverfront Study.

Our review revealed that the proposed structure would probably have an effect on the existing Corps flood control project on the South Branch of the Rahway River in the City of Rahway, New Jersey. This effect is expected to be minimal on the integrity of the Corps project but possibly significant on the operational efficiency of our project's flap gates due to silt accumulation and possible corrosion effects from the permanent pool. Your proposed project is not expected to have a significant impact on any other Corps projects or studies in the Rahway River Basin.

We suggest that the City of Rahway be advised of the Corps concern about the impacts of your proposed project. If you or representatives of the City of Rahway wish to discuss this matter further with the Corps, please contact Mr. Jesse Rosen at (212) 264-0437.

As requested, information on the permit process is inclosed.

Sincerely,

Samuel P. Tosi

SAMUEL P. TOSI
Acting Chief, Planning Division

1 Incl
As stated

H.L.Z

Date Answered .....
Under Study By.....

Elson T. Killam Associates, Inc.

27 Bleeker Street, Millburn, New Jersey 07041 Environmental and Hydraulic Engineers

▪ Telephone (201) 379-3400 ▪ Telex: 642-057 ETK ASSOC MIBN

Leo J. Coakley, P.E.
Senior Associate

August 23, 1982

Department of the Army
New York District
Corps of Engineers
26 Federal Plaza
New York, NY 10278

Attention: Mr. Samuel P. Tosi
Acting Chief, Planning Division

Re: 851 - Rahway River Low Flow Control Structure, City of Rahway Union County, New Jersey

Gentlemen:

In your letter of April 20, 1982, you stated that your review of the proposed project to provide a low flow control structure on the Rahway River was expected to have a minimal effect on the existing Corps flood control project in that area. However, you indicated a concern with the effect on the operational effiency of the existing flap gates due to silt accumulation and possible corrosion effects from the permanent pool. On April 22, 1982 we met in the field with Mr. Jesse Rosen and Mr. Joseph Staigar of your office to review the situation relative to the flap gates. The lowest flap gate in the project area protects a 30 inch diameter pipe with an invert elevation at approximately 0.9 feet above sea level. Thus, with a spillway crest at elevation 2.5, the flap gate would be partially submerged. Since that time we have given consideration to the alternative suggested by Mr. Rosen of lowering the design elevation of the spillway crest to elevation 1.0.

Field observations indicate that extensive portions of the stream bed of the Rahway River and the South Branch of the Rahway River are at approximately one foot below sea level. Therefore, with a design spillway crest at elevation 1.0, the pool depth would be approximately two feet, which would not be suitable for summer recreational purposes (boating) and would necessitate extensive excavation in order to have an adequate pool depth during periods of low tide.

In view of the fact that the average high tide level in the area is at elevation 3.6, which would be approximately 1.1 feet above the proposed

permanent pool level, and the lowest flap gate would be submerged by only 1.6 feet by the pool, and in order to limit the quantity of excavation required to implement the project objectives, we request your consideration of approval of a permanent pool at elevation 2.5. The control structure would include a gate facility which would permit lowering the water level as necessary to undertake any maintenance required. It would also be possible to operate the facility in a manner in which the permanent pool level would be maintained at elevation 2.5 during the summer recreational months and could be maintained at a lower level during the winter months.

We have discussed the above concept with Mr. Frank P. Koczur, the Director of Public Works and City Engineer for the City of Rahway. Mr. Koczur indicated that the City personnel would have the capability to undertake any required maintenance at the flap gate facilities. In a prior memorandum, Mr. Koczur also indicated that the Department of Public Works possesses the equipment required to handle any silting or sedimentation build up in the storm sewer system.

In a telephone conversation of August 18, 1982, Mr. Jesse Rosen suggested that we put the above information in the form of a letter for your further consideration. In the event that you have any further reservations regarding approval of a permanent pool at elevation 2.5, we request that we have the opportunity to meet with you to further discuss the conditions of this proposed project.

Thank you for your cooperation.

Very truly yours,

ELSON T. KILLAM ASSOCIATES, INC.

Leo J. Coakley

LJC:bah

cc: Mr. R. Rosa
Mr. F. Koczur

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
26 FEDERAL PLAZA
NEW YORK, N. Y. 10278

REPLY TO
ATTENTION OF:
NANPL-FA

20 September 1982

RECEIVED
SEP 24 1982
ELSON T. KILLAM ASSOCIATES, INC.
ENVIRONMENTAL & HYDRAULIC ENGINEERS

Elson T. Killam Associates, Inc.
27 Bleeker Street
Millburn, New Jersey 07041

Gentlemen:

Reference is made to your letter dated 23 August 1982 explaining the rationale behind your proposal for a low flow control structure across the Rahway River in the City of Rahway, New Jersey. The proposal of a crest elevation of 2.5 feet MSL is acceptable to this office contingent on our receipt of assurances from the City of Rahway that the drainage structures and flap gates of the Corps project on the South Branch will be maintained regularly. The integrity of the Corps flood control project is dependent on the proper operation of these gates and periodic inspection and maintenance will help to insure its integrity.

If you have any additional comments please contact Mr. Jesse Rosen at (212) 264-0437 or Mr. Michael Thompson at (212) 264-9087.

Sincerely,

Samuel P. Tosi

1 Incl
As stated

SAMUEL P. TOSI
Acting Chief, Planning Division

LDC

Under S... By.....

THE CITY OF RAHWAY, NEW JERSEY

OFFICE OF THE MAYOR

DANIEL L. MARTIN
MAYOR

October 19,1982

Mr. Samuel P. Tosi
Acting Chief, Planning Division
Department of the Army
New York District
Corp of Engineers
26 Federal Plaza
New York, N.Y. 10278

Dear Mr. Tosi,

This letter is a response to your letter of September 20,1982 to Elson T. Killam Associates regarding the City of Rahway's proposed low flow control structure across the Rahway River. It is currently the City's responsibility to maintain the drainage structures and flap gates on all Corps Flood Control projects within the City. The City has the capability to and will continue to assume this responsibility, and if additional maintenance is required on any drainage structures or flap gates as a result of the low flow control structure, the City will perform that maintenance. The City realizes that the proper operation of these gates is essential to the proper functioning of the Corps Flood Control project which in turn is essential to maintaining the quality of adjacent neighborhoods in Rahway. Consequently, it is in the City's best interest that these drainage structures and flap gates be regularly and properly maintained.

Very truly yours,

Daniel L. Martin
Mayor

DLM:im

AGREEMENT BETWEEN

THE UNITED STATES OF AMERICA

AND

THE CITY OF RAHWAY, NEW JERSEY

FOR LOCAL COOPERATION AT

RAHWAY RIVER SOUTH BRANCH, NEW JERSEY
FLOOD CONTROL PROJECT

THIS AGREEMENT entered into this 8 day of March 1972 by and between the UNITED STATES OF AMERICA (hereinafter called the "Government"), represented by the Contracting Officer executing this agreement, and the CITY OF RAHWAY, (hereinafter called the "City"), WITNESSETH THAT:

WHEREAS, construction of the Rahway River, South Branch, Flood Control Project, (hereinafter called the "Project ") was authorized by Section 205 of the Flood Control Act of 1948 (Public Law 858, 80th Congress, 2nd Session), as amended; and

WHEREAS, the City hereby represents that it has the authority and capability to furnish the non-Federal cooperation required by the Federal legislation authorizing the Project and by other applicable law; and

WHEREAS, the Act of Congress, Public Law 91-646, approved 2 January 1971, and cited as the "Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970", provides for uniform and equitable treatment of persons displaced from their homes, businesses, or farms by Federal and Federally assisted programs and establishes uniform and equitable land acquisition policies for Federal and Federally assisted programs; and

WHEREAS, Section 207 of said Public Law 91-646, provides that whenever real property is acquired by a State agency or local subdivision thereof and furnished as a required contribution incident to a Federal program or project, the Federal Agency having authority over the program or project may not accept such property unless such State agency or local subdivision thereof has made all payments and provided all assistance and assurance as are required of a State agency or local subdivision thereof by Sections 210 and 305 of said Act.

NOW, THEREFORE, the parties agree as follows:

1. The City agrees that, if the Government shall commence construction of the Rahway River, South Branch, New Jersey, Flood Control Project substantially in

accordance with Federal legislation authorizing such Project, Section 205 of the Flood Control Act of 1948 (PL 858, 80th Congress, 2nd Session), as amended, the City shall, in consideration of the Government commencing construction of such Project, fulfill the requirements of non-Federal cooperation specified in such legislation, to wit:

a. Provide without cost to the United States all lands, easements, and rights-of-way including spoil areas, within said City, necessary for the construction, pursuant to the requirements of Section 210 and 305 of Public Law 91-646, subject however to the provisions of Section 207;

b. Hold and save the United States free from damages due to the construction works;

c. Maintain and operate without expense to the United States all works or portions thereof after completion in accordance with regulations prescribed by the Secretary of the Army;

d. Provide without cost to the United States for the relocation of utilities, buildings, raising of roads and manholes, construction of the Mill Street bridge and construction of appurtenant sidewalks and curbs;

e. Protect the channel and flood control works from encroachment or obstruction including waste disposal that would reduce their flood carrying capacity. Also take appropriate measures to control development in fringe areas not protected by the improvement with a view to preventing an undue increase in the flood damage potential;

f. Understand that the Government is not committed or obligated in any way to complete the said work or any part thereof and that the City agrees to accept any part of said project;

g. Pay all Federal costs in excess of $1,000,000;

h. Notify interests affected at least annually that the improvements will not provide complete protection from floods greater than the design condition.

2. The City hereby gives the Government a right to enter upon, at reasonable times and in a reasonable manner, lands which the City owns or controls, for access to the Project for the purpose of inspection, and for the purpose of completing, maintaining and operating the Project, if such inspection shows that the City for any reason is failing to complete or maintain and operate the Project in accordance with the assurances hereunder and has persisted in such failure after a reasonable notice in writing by the Government delivered to the Mayor of the City. No completion, maintenance and operations by the Government in such event shall operate to relieve the City of responsibility to meet its obligations as set forth in paragraph 1 of this Agreement, or to preclude the Government from pursuing any other remedy at law or equity.

3. This agreement is subject to the approval of the Secretary of the Army.

IN WITNESS WHEREOF, the parties hereto have executed this contract as of the day and year first above written

THE CITY OF RAHWAY,
NEW JERSEY

BY: Daniel L. Martin
DANIEL L. MARTIN
Mayor, City of Rahway, New Jersey

ATTEST

(SEAL)

STATE OF NEW JERSEY
COUNTY OF UNION
CITY OF RAHWAY

On this 8 day of March, in the year One Thousand Nine Hundred 72 before me, the subscriber, personally came Daniel L. Martin, to me known and known to me to be the Mayor of the City of Rahway, New Jersey, and the same person described in and who executed the within instrument and he duly acknowledged that he executed the same as Mayor of the City of Rahway, New Jersey.

NOTARY PUBLIC

NOTARY PUBLIC OF NEW JERSEY
My Commission Expires June 26, 1974

THE UNITED STATES OF AMERICA

BY: James W. Barnett
JAMES W. BARNETT
Colonel, Corps of Engineers
District Engineer
Contracting Officer

DATE: 16 March 1972

APPROVED:
WOODROW BERGE
Director of Real Estate 26 July 1972

FOR ROBERT F. FROEHLKE
Secretary of the Army